What is claimed is:

1. A thermal barrier coating system comprising a metal substrate, a metal bonding layer, and a ceramics thermal barrier layer formed on the surface of the metal substrate via the metal bonding layer by an electron beam physical vapor deposition method, wherein the ceramics thermal barrier layer has a columnar structure of a stabilized zirconia containing a stabilizer, and also contains 0.1 to 10 mol% of lanthanum oxide.

2. The thermal barrier coating system according to claim 1, wherein the stabilizer contained in the ceramics thermal barrier layer is at least one kind of an oxide selected from the group consisting of yttrium oxide, erbium oxide, gadolinium oxide, ytterbium oxide, neodymium oxide, praseodymium oxide, cerium oxide and scandium oxide.

3. The thermal barrier coating system according to claim 1, wherein the ceramics thermal barrier layer has a composition represented by the general formula: $(Zr_{\alpha}Hf_{1-\alpha})O_2$-$\beta$ mol%(M_2O_3)-γ mol%(La_2O_3) (wherein M is an element constituting the stabilizer and is at least one element selected from Y, Er, Gd, Yb, Ce, Nd, Pr and Sc, and α, β and γ are coefficients) and the coefficients α, β and γ satisfy

the relationships: $0.05 < \alpha < 1$, $3 \leqq \beta \leqq 15$, and $0.1 \leqq \gamma \leqq 10$.

4. The thermal barrier coating system according to claim 1, wherein the ceramics thermal barrier layer is composed of a plurality of columnar grains extending vertically to the surface of the metal substrate and having an orientation in the direction of the (100) or (001) plane, laminar or bar-shaped subgrains being arranged on the surface of the columnar grains, nano-size pores being formed in each columnar grain, and wherein the ceramics thermal barrier layer has a porosity of 10 to 50% by volume.

5. The thermal barrier coating system according to claim 1, wherein the metal bonding layer is made of one of an MCrAlY alloy (wherein that M is at least one kind of metal selected from Ni, Co, Fe, and an alloy thereof) and platinum aluminide.

6. The thermal barrier coating system according to claim 1, wherein the metal substrate, on which the ceramics thermal barrier layer is formed via the metal bonding layer, is gas turbine part.

7. The thermal barrier coating system according to claim 6, wherein the gas turbine part is at least one selected from

the group consiting of a turbine nozzle vane, a turbine blade and combustion chamber parts.

8. A thermal barrier coating system comprising a metal substrate, a metal bonding layer, and a ceramics thermal barrier layer formed on the surface of the metal substrate via the metal bonding layer by an electron beam physical vapor deposition method, wherein the ceramics thermal barrier layer has a columnar structure of stabilized zirconia-hafnia solid solution containing a stabilizer, and also contains 0.1 to 10 mol% of lanthanum oxide.

9. The thermal barrier coating system according to claim 8, wherein the stabilizer contained in the ceramics thermal barrier layer is at least one kind of an oxide selected from the group consisting of yttrium oxide, erbium oxide, gadolinium oxide, ytterbium oxide, neodymium oxide, praseodymium oxide, cerium oxide and scandium oxide.

10. The thermal barrier coating system according to claim 8, wherein the ceramics thermal barrier layer has a composition represented by the general formula:
$(Zr_{\alpha}Hf_{1-\alpha})O_2-\beta$ mol% $(M_2O_3)-\gamma$ mol% (La_2O_3) (wherein M is an element constituting the stabilizer and is at least one element selected from Y, Er, Gd, Yb, Ce, Nd, Pr and Sc, and α, β and

γ are coefficients) and the coefficients α, β and γ satisfy the relationships: $0.05 < \alpha < 1$, $3 \leqq \beta \leqq 15$, and $0.1 \leqq \gamma \leqq 10$.

11. The thermal barrier coating system according to claim 8, wherein the ceramics thermal barrier layer is composed of a plurality of columnar grains extending vertically to the surface of the metal substrate and having an orientation in the direction of at least one of the (100) and (001) plane, laminar or bar-shaped subgrains being arranged on the surface of the columnar grains, nano-size pores being formed in each columnar grain, and wherein the ceramics thermal barrier layer has a porosity of 10 to 50% by volume.

12. The thermal barrier coating system according to claim 8, wherein the metal bonding layer is made of one of an MCrAlY alloy (wherein that M is at least one kind of metal selected from Ni, Co, Fe, and an alloy thereof) and platinum aluminide.

13. The thermal barrier coating system according to claim 8, wherein the metal substrate, on which the ceramics thermal barrier layer is formed via the metal bonding layer, is gas turbine part.

14. The thermal barrier coating system according to claim 13,

wherein the gas turbine part is at least one selected from the group consiting of a turbine nozzle vane, a turbine blade and combustion chamber parts.

15. A method of manufacturing a thermal barrier coating system comprising a metal substrate, a metal bonding layer, and a ceramics thermal barrier layer formed integrally on the surface of the metal substrate via the metal bonding layer, which comprises forming the metal bonding layer on the surface of the metal substrate, simultaneously melting two kinds of raw materials which are a stabilized ZrO_2 deposition material and a La-based composite oxide deposition material by an electron beam physical vapor deposition method.

16. A method of manufacturing a thermal barrier coating system comprising a metal substrate, a metal bonding layer, and a ceramics thermal barrier layer formed integrally on the surface of the metal substrate via the metal bonding layer, which comprises forming the metal bonding layer on the surface of the metal substrate, simultaneously melting two kinds of raw materials which are a stabilized ZrO_2-HfO_2 and a La-based composite oxide deposition material by an electron beam physical vapor depositionmethod, and depositing the resulting mixed vapor on the surface of the metal bonding layer to form the ceramics thermal barrier layer.

17. A method of manufacturing a thermal barrier coating system comprising a metal substrate, a metal bonding layer, and a ceramics thermal barrier layer formed integrally on the surface of the metal substrate via the metal bonding layer, which comprises forming the metal bonding layer on the surface of the metal substrate, melting a composite oxide deposition material, which is obtained by adding La_2O_3 to a stabilized ZrO_2, by an electron beam physical vapor deposition method, and depositing the resulting raw material vapor on the surface of the metal bonding layer to form the ceramics thermal barrier layer.

18. A method of manufacturing a thermal barrier coating system comprising a metal substrate, a metal bonding layer, and a ceramics thermal barrier layer formed integrally on the surface of the metal substrate via the metal bonding layer, which comprises forming the metal bonding layer on the surface of the metal substrate, melting a composite oxide deposition material, which is obtained by adding La_2O_3 to stabilized ZrO_2-HfO_2, by an electron beam physical vapor deposition method, and depositing the resulting raw material vapor on the surface of the metal bonding layer to form the ceramics thermal barrier layer.